Agriculture and Agri-Food Canada
Prairie Farm Rehabilitation Administration

Agriculture et Agroalimentaire Canada
Administration du rétablissement agricole des Prairies

RURAL WATER PIPELINE HANDBOOK FOR SASKATCHEWAN

Group Organization and Administration

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Canada

RURAL WATER PIPELINE HANDBOOK FOR SASKATCHEWAN

GROUP ORGANIZATION AND ADMINISTRATION

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Section 1 General

1.0 Initial Contact

Communities or groups of individuals interested in developing a rural water pipeline should first contact the local PFRA office for technical and possible financial assistance. Appendix A contains a map showing the area covered by each of the PFRA District Offices, including the phone number of each office.

1.1 Background

Initial contact with PFRA is often verbal and informal. PFRA can perform conceptual/feasibility studies before the group becomes formally organized. Conceptual pipeline layouts and cost estimates can be performed at this stage using existing information. If the group wishes, conceptual layouts and cost estimates may be presented at a public meeting.

Information surveys can be conducted by the group to identify interested patrons. Often this is performed using a written questionnaire (see example in Appendix B). Various methods of questionnaire distribution can be employed, each having certain advantages and disadvantages.

It is common for the group to request PFRA to do more than one pipeline layout, cost estimate and presentation. PFRA will normally respond to an appropriate number of these requests as required to establish a project budget and assess feasibility. This will assist the group in determining which users are to be included in a field survey and the preliminary and final design stages.

If a group wishes to proceed to the preliminary design stage, they must form a legal entity. Once an organization is established, the group should pass resolution requesting PFRA's assistance (Appendix C) and submit a "PFRA RWDP Application Assistance Form". This form is available from the local PFRA district office.

CAUTION: Project planners should emphasize that layouts and costs are conceptual only. The "final" cost can not be completely determined until construction is complete.

In any given year, many pipeline projects may be considered eligible for assistance under PFRA's Rural Water Development Program (RWDP). The current (year 2000/2001) Policy for the RWDP is provided in Appendix D. In general, PFRA can provide technical assistance and financial assistance for a percentage of eligible costs for

the pipeline project. Under the terms and conditions of the RWDP, the group must pay eligible costs up front, and submit invoices to PFRA who will forward their share of the eligible costs to the group as soon as possible.

Other programs may have some funding available for group and community pipelines. For more information on other possible programs, groups and communities should contact the local PFRA District Office. If funding is obtained through other federal programs, funding through the PFRA RWDP will be capped so that total federal contributions will not exceed those allowed if funded through the RWDP alone. PFRA must be informed if additional funding is obtained on any project.

1.2 Getting Organized

After the first public meeting, if there is interest in the project, the group should form a steering committee to be the main contact with PFRA. This committee, which should include at least a chairperson, secretary and treasurer, will assist in the project planning and design. Once the group decides to proceed to the preliminary design stage, the group determines which type of organization it is going to form, and installs a Board of Directors. The group should formally organize into one of the organizations described in the following paragraph. The group must do this in order to deal with regulatory agencies, to enter into construction contracts, and to apply for government funding.

The types of associations normally formed are: Cooperatives, Water Users Associations, Non-Profit Corporations and Public Utilities. A Public Utility formed under the Rural Municipality (R.M.) Act has one advantage over the others in that the utility has access to the R.M. tax base.

Once all the necessary approvals are obtained, and subject to the availability of funds, PFRA and the group will enter into a cost sharing agreement. A detailed cost estimate is required for all the documents.

The agreement with PFRA is generally in force for one year but can be amended or extended if required. One original of the agreement is returned to the Group after it has been signed.

Once the Group has formed a legal entity it should develop a Request for Proposals for Engineering Services and a Terms of Reference. PFRA can assist the Group in the preparation of the Terms of Reference for engineering services, and will provide a list of consulting firms who have the capacity to undertake the design and engineering services during construction of the rural pipeline. PFRA will prepare a project brief which describes the project, provides cost estimates, and provides a plan of the project showing the pipeline layout and location of pumping stations. The project brief can be used as the project description required by Federal and Provincial regulatory agencies.

The selection of a consulting firm will be the Group's responsibility; however, PFRA will assist the group in evaluating proposals.

1.3 Agencies Involved in a Group Pipeline

Table 1. Agencies Involved in Every Rural Pipeline Project and Their Roles.

Agency	Role in Pipeline Project
Group	Planning, arrange financing, obtaining approvals, tendering, construction administration and operation of project including water service agreements and land control.
PFRA	Technical assistance (planning, assistance in obtaining approvals, conceptual/preliminary design, assistance in final design tendering and construction inspection) and financial assistance.
Private Engineering Consultants	Engaged by the group to provide assistance in the preliminary design, conduct project final design, and provide engineering services during construction and post construction.
Saskatchewan Water Corp.	Approval to construct and operate works.
Provincial Health Boards	Plumbing permits and approval of backflow prevention devices at delivery points.
Saskatchewan Environment and Resource Management	Involved in approval to construct via Sask Water. May make approval to construct conditional on modification to pumps, chlorination, testing, and environmental mitigation.
Rural Municipality	Approval to construct in municipal right-of-way, approval to cross roads. Establish a Public Utility if this option is chosen.
Village/Town/City/ Other Group	Agreement to supply water to the pipeline group (if applicable).

Table 2. Agencies That May be Involved in a Rural Pipeline Project and Their Roles

Agency	Role in Pipeline Project
Cooperatives Branch, Utility, etc.	Registration of cooperative, water users association, non-profit corporation, public utility.
Saskatchewan Highways & Transportation	Approval to construct in or adjacent to highway right-of-way, approval to cross highways.
Railways (CNR/CPR)	Approval to cross railway.
Provincial and Federal Fishery Agencies	Shoreline Alteration Permit (Provincial) required in areas of existing or potential fish habitat. May recommend remedial measures for crossings. Approval needed for intakes.
Fisheries and Oceans Canada	Approval to cross navigable waterways or construct intakes required in waterways of existing or potential for navigation. May recommend remedial measures for crossings.
Saskatchewan Environment and Resource Management	Approval needed to cross critical wildlife habitat, designated lands or provincial parks. Provincial Environmental Assessment Approval may also be needed.
Trans Gas	Approval to cross gas transmission lines. [1]
Sask Tel	Location of telephone and fibre optic lines. [1] For fibre optic lines an agreement will be necessary to cross lines and easements.
Sask Energy	Approval to cross gas distribution lines. [1]
Sask Power	Location of underground power. [1] An agreement will be necessary to cross under existing overhead and underground transmission lines and easements. Lines beyond meter in yards are to be located by group or landowner affected.
Chief Surveyor	Easement Preparation/Legal Drawings.
Land Titles Office Saskatchewan Justice	Title searches, registration of easements and/or caveats.
Indian and Northern Affairs Canada	Ensure routes do not interfere with Treaty Land Entitlement lands.
Revenue Canada	Tax Rebate
Any other agency who's easement the pipeline crosses	Approval to cross as required by the agency.
Individual Landowners	Easements for pipeline. Water service (Subscriber) agreements.
Sask Water Utilities Branch	May provide source from Sask Water Utility water pipelines.
Rural Development Lands Branch	Easements to cross Provincial Crown Land.

[1] Will insist on prior notice so they can have an inspector present for crossing.

1.4 List of Existing Projects

Included in Appendix F is a list of existing group pipeline projects constructed in Saskatchewan. Where known, this list provides the name of the contact person, the PFRA District the project was constructed in, the number of connections, the length of pipe installed per connection and the total cost per connection.

1.5 Proceeding to Construction

A list of responsibilities of the Group, PFRA and private consultants is presented in Appendix G. This list can be used as a general guideline and checklist for progression of a pipeline project from the conceptual stage through to actual construction.

The final design will be prepared either by the retained consultant alone, or by the consultant in conjunction with PFRA, based on field survey data obtained by the consultant and/or PFRA, with assistance from the group. PFRA, in conjunction with the engineering consultant selected by the group, may assist in the preparation of contract documents for the group to invite or advertise for tenders. PFRA will require certain standards for construction of the pipeline and pumping facilities to qualify for financial assistance. In addition, certain contractual requirements are recommended by PFRA (i.e. tender security, construction security and insurance conditions). The following items are recommended to be included in tender packages:

- Tender and Contract Form
- Statement of Equipment
- List of Subcontractors
- Instructions to Tenderers
- Supplementary Contract Security Conditions
- Supplementary Insurance Conditions
- General Conditions
- Specifications
- Plans

The group has the option to either advertise for tenders or invite tenders. If advertising, a three to four week tender period is recommended. If inviting tenders, a two to three week period is recommended. Depending on the conditions, this tender period can be shortened but it should not be shortened by more than one week.

For large projects or components of projects a minimum of three bids are required by PFRA to ensure the tendering procedure is fair and that a reasonable price is obtained for the work. For small projects or components of a project, the following guidelines regarding tendering may be followed:

Estimated Cost of Work	Tender Procedure	Minimum Number of Estimates or Tenders	Contract Security	Tender Security	Method of Tendering
less than $5,000	tenders not necessary; group may hire work out based on estimate of value of work	One	None	None	Informal
$5,000 to $30,000	Informal	Two	Optional	None	Invited or Advertised
$30,000 to $500,000	Formal	Three	Required	Required	Invited or Advertised
$500,000 to $1,000,000	Formal	Three	Required	Required	Recommend advertising
>$1,000,000	Formal	Three	Required	Required	Advertising

PFRA recommends that the tender opening be a public-tender opening. Assistance and advice will be given accordingly. PFRA requires tender award be in keeping with the Government of Canada Contract Regulations (i.e. low bidder normally accepted). The group also has the option of purchasing materials and doing their own work or purchasing materials and entering into an installation contract for the materials purchased. These variations may be discussed with PFRA for an acceptable alternative and how PFRA may assist on them.

After the contract has been awarded, the consultant or PFRA staff may stake the pipeline centreline in the field and assist the consultant in construction inspection. As a minimum, the consultant or PFRA staff will be present to witness critical events in the pipeline construction. These may include: pipeline filling, pipeline chlorination, pipeline testing, installation of valves, and road and railway crossings. The group should be encouraged to provide regular contract construction supervision. Consultants will be responsible for the inspection phase of projects, and discussion should be held early on as to what degree each party will be involved in construction supervision.

Section 2 PIPELINE ADMINISTRATION AND OPERATION

2.0 General

Once the group has formed a steering committee, and the work has moved beyond the preliminary design stage, the committee should undertake steps to confirm subscribers' commitment to the project. A financial deposit from the subscribers should be collected and an agreement prepared and signed by the subscribers.

Information on developing a subscribers agreement or on any information in the following sections may be obtained by contacting the groups listed in Appendix F or the local PFRA office listed in Appendix A.

The following are factors which should also be set out or considered in the subscribers agreement.

2.1 Fees for Operation and Maintenance

The group will need to establish a water use fee structure to offset the costs of water, insurance, operation and maintenance of pumping equipment, power, pipeline repairs, meter reading and other items. This cost should also be set up to cover the long term replacement of equipment and pipeline upgrades. Most groups levy a unit cost fee and/or a fixed surcharge on the water bill to cover these costs.

PFRA may assist the water user group in exploring other financing options using a financing model developed for this purpose. The local PFRA office can provide more information on this option.

2.2 Penalty for Late Hook-up

Late hook-up penalties may be levied against late comers that wish to connect to an existing pipeline branch. The amount of the penalty is determined by the pipeline group.

2.3 Replacement of Equipment and Pipeline

Replacement equipment should be mechanically equivalent to the original to ensure that the system continues to operate as it was designed. Replacement pipeline should be the same or higher pressure rating and diameter. The group should contact their consultant engineer regarding replacement items.

2.4 Insurance

The group should carry adequate liability insurance on a continuing yearly basis. This insurance may be required for incidents such as: broken pipeline causing damage to persons or property or water source contamination caused by cross connection control failure. The amount of insurance required will depend on the damage potential. Information on rates and possible levels of insurance required may be obtained from an insurance broker.

2.5 Renewals of Agreements

Certain agreements between the group and various agencies or local governing administrations concerning issues such as quantities of water used, land control, or annual equipment testing may have an expiration date. It is the groups responsibility to ensure that these agreements are maintained and/or updated throughout the life of the pipeline. Failure to maintain these agreements could result in temporary or permanent loss of operating permits, loss of water and liabilities.

2.6 Water Rate Charges

The group sets the water purchase cost for its members. If the group purchases water from a utility or community they must negotiate the cost of the water being purchased. The rate charged by the utility/community is subject to change depending on the agreement reached between the two parties involved. Generally the water is metered and a charge is levied to the group based on a certain unit rate per thousand imperial gallons or a set number of cubic metres. The group will have to renegotiate this rate at specified intervals as set out in the agreement between the group and the water purveyor.

The group must meter its individual members and bill each member according to consumption. They should also charge a set administration and maintenance fee in addition to water charges.

Section 3 Approvals and Agreements

3.0 General

Another step in the process is to apply for approvals to enter, cross, or access lands or facilities which may be required. The group must apply to government departments, individuals, utilities or affected companies for these approvals.

A table listing contacts for most crossings (some of which are described in this section) is included in Appendix H. The table includes: contact names and phone numbers and agreement information. Some of the detailed crossing and approval information is provided in this section.

3.1 Sask Water Approval to Construct

The group or community is required to obtain an approval to construct from Sask Water prior to proceeding to construction. Approvals to construct are required for pipelines, pumphouses and wells, whether they are completely new projects or additions/modifications to existing ones. Sask Water reviews the request for Approval to Construct and forwards the request to various provincial agencies for their approval and/or recommendations. An appropriate amount of time for the “Approval to Construct” should be allowed for in planning a pipeline project.

The group will require written documentation on the water source for the “Approval to Construct” a pipeline, either by way of a formal agreement with a water purveyor or a water rights license for a new supply.

Sask Water will require detailed drawings of the project, proof of land control, copies of agreements for crossings etc., and information regarding the proposed water source (e.g. agreement with a City to supply water). A complete check list of Sask Water's requirements is included in Appendix I.

An “Approval to Operate” will also be required from Sask Water once the project is completed.

3.2 Rural Municipality

All affected Rural Municipalities(RM) will have to approve all pipeline crossings of municipal roads, and (if applicable) for the installation of the pipeline in municipal road right-of-ways. These approvals do not normally require a formal agreement, but they should all be passed by council and the group should obtain a written resolution from the RM. The RM may add some conditions or restrictions to any or all of the agreements (e.g.'s approval to install pipe in ditch subject to certain hours and/or signage). In these

instances where the group wishes to formalize into a public utility board, the affected R.M.(s) will have to pass a bylaw establishing the public utility and assessing and levying the cost of the work.

3.3 Water Supply

The group will require written documentation allowing them to use water. This can be accomplished by a formal agreement or a water rights license, depending on the nature of the supply.

3.3.1 Existing Supply

When the group is tying into an existing supply such as a town system, a water rights license may not be required but a written agreement with the water purveyor is a requirement in all cases. The terms of each agreement must be worked out jointly between the purveyor and the group. As a minimum, the agreement should address the unit cost of the water, the minimum use charge (if any), the maximum volume of water available, the pressure and flow guarantee (if any), and the expiration date of the agreement. Generally, the group's water rate charge is based on the town's commercial or residential rate. The agreement should be accompanied by a resolution from town council approving of the agreement between the group and the community for the sale of water.

An example of an agreement for the sale of water is included in Appendix J.

3.3.2 New Supply

In the case of a new supply, the group must obtain a water rights license from Sask Water. The process of obtaining a license is designed to ensure that not only will the group have adequate water for their demands, but that surrounding supplies will not be adversely affected by the groups withdrawal of water. Sask Water has a detailed list of requirements that the group must address prior to an "Approval to Construct" being granted (See Appendix I). PFRA may provide various types of assistance for this facet of the project. Sask Water also requires new sources be posted for 60 days prior to issuing an "Approval to Construct."

3.3.2.1 New Groundwater Supply

In the case of a new groundwater supply, a regional groundwater investigation must be undertaken. A pump test, detailed geologic analysis, and approval from all groups, communities or individuals within a certain radius of the well are required to develop a supply.

3.3.2.2 New Surface Water Supply

In the case of a new surface water supply, a detailed hydrologic analysis, dam/dugout design and management plan would be required.

3.4 Highways

3.4.1 Highway Crossings

Approval to cross Provincial Highways will be required for all highway crossings. The Department of Highways requires installations augered beneath the highway, and in most cases, installing an encasement pipe. The encasement pipe is to support the water supply pipe and ensure that if the pipeline were to burst beneath the highway, water would surface away from the travelled surface of the highway. The encasement pipe must extend to at least the shoulder of the road. Encasement pipes are sized to be practical, extend beyond the shoulder of the road, and designed for an even length of pipe. The outside diameter of the casing pipe should be as close as possible to the inside diameter of the bore hole. Bell and spigot Series PVC pipe in 20 foot lengths have been used as encasement pipes. Saskatchewan Highways and Transportation should be contacted to confirm that PVC may be used. In some cases Saskatchewan Highways and Transportation may require that steel casing pipe be used. Marker posts are installed on the highway property line where the pipeline crosses the highway. Highway crossings should be made perpendicular to the highway but may be approved at angles less than 90 degrees.

The submission to the Department of Highways should be made to the appropriate district office and should include a plan showing the location of the crossing, a cross-section of the crossing (showing depths of cover over the pipe in the ditch and in the centre of the road), details of the water supply pipe (size and pressure rating), operating pressures of the water supply pipe, details of the encasement pipe (size and pressure rating) and proposed method of installation (auguring).

A Department of Highways application form and a sample application is included in Appendix K.

3.4.2 Installing Pipe in or near Department of Highways Road Allowances

Approval to install pipe parallelling the road surface in the right-of-way or within 90 metres of the highway centerline requires approval from the Department of Highways. It is not the preferred pipeline route as approval from Highways cannot be guaranteed. It also exposes the group to possible future pipe re-grading or re-locating should the road be widened or the ditch grades changed in the future.

3.5 Railways

Approval to cross Railways is required for all railway crossings for all projects. Railway Crossings must be installed in accordance with the Canadian Transport

Commission's General Order E-10 (see Appendix L) and the requirements of the railway involved. The Railway should be contacted to obtain their most recent guidelines and requirements. In general, Railways require auguring beneath the railway and installing an encasement pipe to support the water supply pipe and ensure that if the pipeline were to burst beneath the railway, water would surface away from the railway right-of-way. The encasement pipe is steel with the wall thickness determined using General Order E-10. Marker posts are installed on the railway property line where the pipeline crosses the railway to identify the existence of the water pipeline. Railway crossings are normally made perpendicular to the railway but may be approved at angles less than 90 degrees.

The submission to the Railways should be made to the appropriate regional office and should include a plan showing the location of the crossing with references to property lines, a cross-section of the crossing (showing depths of cover over the pipe in the ditch and in the centre of the railway), details of the water supply pipe (size and pressure rating), operating pressures of the water supply pipe, details of the encasement pipe (size and pressure rating), location of nearest shut-off valves and proposed method of installation (auguring).

A sample application and list of information required by the railways on the drawing submitted for approval is included in Appendix L. Approval to cross railways should be done as soon as possible as they may take two months or more to obtain. NOTE: If agreement cannot be reached by the group and the Railway company, the Canadian Transportation Agency will negotiate an agreement with the Railway company. Such an agreement or approval triggers the Canadian Environment Assessment Act (CEAA).

3.6 Major Gas and Oil Pipelines

Each major gas and oil company has their own set of rules for crossings that must be obtained before tendering the pipeline. Usually the company will request a drawing along with a request for approval to cross (from the group). The company will likely insist on auguring underneath their pipeline, will not allow open cutting within a certain distance of the pipeline, and may request the water pipeline be installed in an encasement pipe. An encasement pipe is recommended, to protect the water supply pipe from possible damage due to a pipeline break and petroleum spill (in the case of a petroleum pipeline). They will also usually insist on being given a certain amount of notice prior to crossing, such that a representative can be on site to inspect the crossing; the cost of which may be absorbed by the company. They will also require the group enter into a crossing agreement with them, usually at little cost to the group.

Trans Gas is responsible for the high pressure natural gas feeders throughout the Province of Saskatchewan. The Trans Gas lines require a formal agreement to cross, executed between the group or community and Trans Gas. This is unlike the smaller diameter, lower pressure mainlines and laterals for which an agreement to cross is not required. These smaller diameter, lower pressure natural gas pipelines are owned and operated by Sask Energy who does not require a crossing permit (see Section 4.9).

Trans Gas approval usually takes less than a month to obtain. Trans Gas will require a plan showing the proposed pipeline route, the Contractor to excavate by hand a distance of 0.6 metres either side of the pipeline, three days notice prior to the crossing to have inspectors on site, and the pipeline be at least 0.6 metres from any Trans Gas line, either above or more generally below.

3.7 River and Creek Crossings

For all instances where a proposed pipeline crosses a creek, stream, river, lake or similar body of water, approval will be required from Provincial Fisheries, Federal Fisheries and the Canadian Coast Guard. In most cases, only fisheries approval is necessary which normally takes less than one month to obtain. Canadian Coast Guard approval, however, can take as much as 3 months to obtain. All three agencies may request some mitigative measures (such as slope protection) and will likely not allow construction during certain times of the year (such as during spawning season). Under the Federal Coordination Regulation - Canadian Environmental Assessment Act (CEAA), PFRA is required to request the Navigable Water Protection Branch, Canadian Coast Guard and Fish Habitat Branch, Fisheries and Oceans to advise PFRA of their interest in a project under CEAA (refer to Appendix M for more details on Environmental Assessment Procedures).

The following table lists some of the many options for crossing creeks, streams, rivers and other bodies of water with a water supply pipeline. Also listed are some likely comments that might be received from various agencies in the approval process for each option.

Crossing Alternative	Comments
Coring Beneath	- Likely not restricted during certain times of the year - Remedial measures required would be restoring any disturbed slopes to original grade and placing erosion protection
Insulated Pipe Installed Above (to a Bridge Deck for example)	- Likely not restricted during certain times of the year - Will require approval from agency who owns/maintains the bridge
Open Cutting (with or without concrete weights on the pipe)	- Likely to be restricted during certain times of the year - Remedial measures required would be restoring disturbed slopes to original grade and placing erosion protection - Will likely not allow the installation of cofferdams or the importing of any fill material
Ploughing (Polyethylene only)	- Likely to be restricted during certain times of the year - Remedial measures required would be restoring disturbed slopes to original grade and placing erosion protection

In some cases, where the impacts of the proposed method of crossing cannot be mitigated and the crossing location cannot be changed, habitat compensation will be required by the Federal Department of Fisheries and Oceans (DFO). DFO strives to balance unavoidable habitat losses with habitat replacement on a project-by-project basis.

As soon as the pipeline route is known, the local PFRA office should contact their PFRA Regional Environmental Officer (REO) (at least 4 to 6 months before the proposed crossing if possible). The REO will advise on the Environmental Assessment Process and liaise with other federal and provincial agencies to determine Environmental Assessment requirements. The users group will be required to request approvals from the various agencies based on the assessment. The project manager may assist the group by applying for approvals on the groups behalf. The local PFRA office should also investigate, and determine the feasibility of various crossing alternatives.

3.8 Easements for Pipelines

When the main or lateral lines of a Community or Group water pipeline crosses over private property, land control is required. This land control must be in place prior to construction and is required regardless of whether the private property in question belongs to a member of the group or not. Land control is usually accomplished in the form of an easement registered on the Certificate of Title in the Land Titles Office.

A typical water pipeline easement (Right of Way Agreement) is included in Appendix N1. Note the areas in bold typing. These areas consist of the name of the Grantor, the name of the Grantee, the legal description of the lands to be crossed and the actual legal description of the easement through the land described or shown in Schedule A (Appendix N2). This easement document has been found to be satisfactory in the past. However, additional conditions are sometimes required or insisted upon by the Grantor or Grantee.

An easement will require the following:

- an affidavit with the signatures of the Grantor, the Grantee and one witness to the signing (Appendix N3);
- an affidavit of the Grantor signed in the presence of a Commissioner of Oaths (Appendix N3);
- an Affidavit of Execution in which the witness to the signing must sign in the presence of a Commissioner of Oaths (Appendix N3); and,
- if the land in question is the "Home Quarter" on which the Grantor and spouse reside the HOMESTEADS ACT must be administered to and signed by the spouse in the presence of a Notary Public or Solicitor or other qualified individual (Appendix N4).

Registration of easements can be done by the group without the aid of a lawyer, provided all the necessary conditions of the Land Titles office are met.

In general there are three options available to describe pipe line easements for registration purposes on Certificates of Titles.

OPTION 1

A metes and bounds description of the lands to be affected by the pipeline is the quickest and most economical approach, providing the conditions are suitable for such a description. Appendix N5 provides procedures, time considerations and costs to prepare typical metes and bounds easements.

OPTION 2

A Right of Way Survey is performed by a Saskatchewan Land Surveyor and the ensuing plan is registered in the Land Titles Office of the corresponding District.

An actual survey is generally only required when the route of a pipeline across the private property becomes complicated with many deflections and intersections of previous registered surveys. See Appendix N[6] for an example of a typical Plan of Right of Way easement procedure, time considerations and costs.

Option 3

A caveat/easement option is also available. This is the registration of a caveat on the affected lands title. The caveat would refer to plans held by the group which would describe the pipeline route. This option would be used in circumstances where it would be difficult to describe a metes and bounds description due to changes in the pipeline route.

A caveat/easement will require:

- a detailed sketch or plan of the pipeline route
- an affidavit with the signatures of the Grantor, the Grantee and one witness to the signing (Appendix N6);
- an affidavit of the Grantor signed in the presence of a Commissioner of Oaths (example in Appendix N2);
- an Affidavit of Execution in which the witness to the signing must sign in the presence of a Commissioner of Oaths (example in Appendix N2); and,
- if the land in question is the "Home Quarter" on which the Grantor and spouse reside the HOMESTEADS ACT must be administered to and signed by the spouse in the presence of a Notary Public or Solicitor or other qualified individual (example in Appendix N3).

3.9 Other Utilities (Sask Energy, SaskPower, SaskTel)

Utilities such as Sask Energy, SaskPower and SaskTel may require the group to sign a formal agreement but it is not common. In general, these utility companies will require a certain amount of advance notice for locating lines and will ask that certain areas be excavated by hand. The following is a summary of the requirements of the various agencies.

Agency	Advance Notice	Requirements
SaskTel	48 hours	- minimum 0.3 metres of separation between telephone cable and pipeline - minimum 0.7 metres of cover over telephone cable after construction - hand exposing cables before excavation for a minimum distance of 1.5 metres on each side of the telephone cable
Sask Energy & Trans Gas	48 hours	- minimum 0.6 metres clearance between water and gas pipeline - hand exposing gas lines before excavation for a minimum distance of 0.6 metres on each side of the gas line - no equipment within 0.6 metres of gas line - Trans Gas will require a crossing agreement
SaskPower	72 hours for "start up" meeting; short notice thereafter	- no equipment allowed within three metres of any exposed electrical conductor (until line staked and hand exposed) - no easement or right-of-way within 5 metres of a SaskPower above-ground structure (e.g. pole or transformer) - hand exposing cables before excavation - SaskPower personnel on site to decide how close equipment can get to the conductor after hand exposing.

It is usually very beneficial to show a local representative of the agency a proposed pipeline route and advise them of the proposed construction schedule as soon as possible to assist them in scheduling their work.

3.10 Treaty Land Entitlements (TLE's)

Any property which is being considered as Treaty Land Entitlement land cannot have any new easements, etc. placed upon it. This should be considered when choosing the route for the pipeline. The Department of Indian and Northern Affairs in Regina should be contacted once a proposed route has been identified to ascertain if there are any possible conflicts with TLE's.

3.11 Heritage Resources

Construction on lands designated as having heritage value may be restricted. A review of the pipeline route by the Heritage Branch, Saskatchewan Municipal Government, may be required to determine if the project affects any known heritage lands, or is in the proximity to known heritage sites. If there are affected heritage resource sites, a Heritage Resource Impact Assessment pursuant to Section 63 of the Heritage Property Act, may be required.

3.12 Sask Health

3.12.1 General

It is the responsibility of the pipeline group to provide its subscribers with a safe and reliable supply of potable water. The group must ensure that the distribution system is adequately protected from any potential contamination hazard originating at individual subscriber sites. This is accomplished by assessing the hazard potential at each tapoff and protecting the system with the appropriate backflow prevention devices.

3.12.2 Cross Connections

The highest potential source of contamination in a pipeline exists at a cross-connection. A cross-connection is the physical connection between a potable drinking water supply line and a potential source of contamination or pollution. In the case of rural distribution lines, farmsteads that are connecting to these lines usually have existing private water supplies (e.g. from a well or dugout). Interconnecting the existing private water supply system with the rural water pipeline system creates a cross-connection. Contamination of the rural water pipeline, and hence the drinking water, can occur when an unprotected cross-connection exists and a backflow condition occurs in which the flow in the pipeline is reversed (e.g. from the existing private source into the pipeline). This condition can be caused by back pressure (e.g. where the private system is under a higher pressure than the pipeline system) or back-siphonage (e.g.. where a negative or reduced pressure exists in the pipeline system).

When choosing a protection method, the following degrees of hazard are considered:

Severe - A cross connection or potential cross connection involving any substance in sufficient concentration to cause death, spread disease or illness, or contain any substance which has a high probability of causing such effect.

Moderate - A cross connection or potential cross connection involving any substance which has a low probability of becoming a nuisance or be aesthetically objectionable if introduced into the domestic water supply.

Minor - An existing connection or a potential connection between the domestic water pipe and any pipe, vat or tank intended for carrying or holding drinking water, which has a low probability of becoming a moderate hazard.

A representative from the local PFRA District Office may assess each water delivery point to determine its hazard potential. Your local Public Health Inspector may be contacted for assistance in this assessment.

3.12.3 Backflow Prevention Devices

The appropriate measure must be taken to protect the system from the varying degrees of potential contamination. The most effective control of backflow is the elimination of the cross connection and/or the installation of an air gap or backflow prevention devices. On PFRA sponsored rural water pipelines, it is required that a backflow prevention device be installed at the pipeline source and at each point of delivery.

Below is a list of backflow prevention methods and devices commonly used on PFRA sponsored rural water pipelines. Further information on backflow devices and prevention is included in Appendix O.

3.12.3.1 Air Gap

An air gap is the unobstructed vertical distance through air between the lowest point of a water supply outlet and the flood level rim of the fixture into which the outlet discharges. This approach is the best means available for protection against backflow and should be used at all points of delivery. To ensure that the risk of contamination is minimized in the event that a cross-connection is made in the future, mechanical backflow prevention devices (described below) should also be installed.

3.12.3.2 Reduced Pressure Principle Backflow Prevention Assembly (RP)

The valve has two independent check valves, separated by a reduced pressure zone, with a relief valve and test cocks. It should be installed to isolate a serve hazard and requires a sump, storm sewer, floor drain or drain pipe to dispose of water during a reduced pressure condition..

3.12.3.3 Double Check Valve Assembly (DCVA)

The valve has two independent check valves, equipped with test cocks and is used to isolate a moderate hazard.

3.12.3.4 Dual-Check Valve (DuC)

The valve has two independent wafer style check valves and is used to isolate a minor hazard.

3.12.3.5 Hose Connection Vacuum Breaker (HCVB)

The valve is a single check with atmospheric vacuum breaker vent and should be installed on all hydrants and hose bibs.

Other backflow prevention valves are available, but the ones above are the most commonly used for pipeline projects. Generally, double check valve assemblies are installed in all situations of minor and moderate hazard ratings. All backflow prevention valves should be tested on a periodic basis.

3.12.4 Plumbing Permits

The Local Health Inspector requires the group to obtain a plumbing permit prior to "constructing, reconstructing, replacing, altering or extending a plumbing system, or part thereof or connecting it to a sewage works and\or water works". The work must also be inspected by a qualified inspector upon completion. (see Appendix O).

3.12.5 Water Testing

All groups should submit water samples to the provincial lab on a regular basis to ensure the safety of the supply. The group should check with the local Public Health Inspector on the exact timing of testing. It is in the group's best interest to perform this testing to avoid any potential for contamination and liability.

3.12.6 Metering

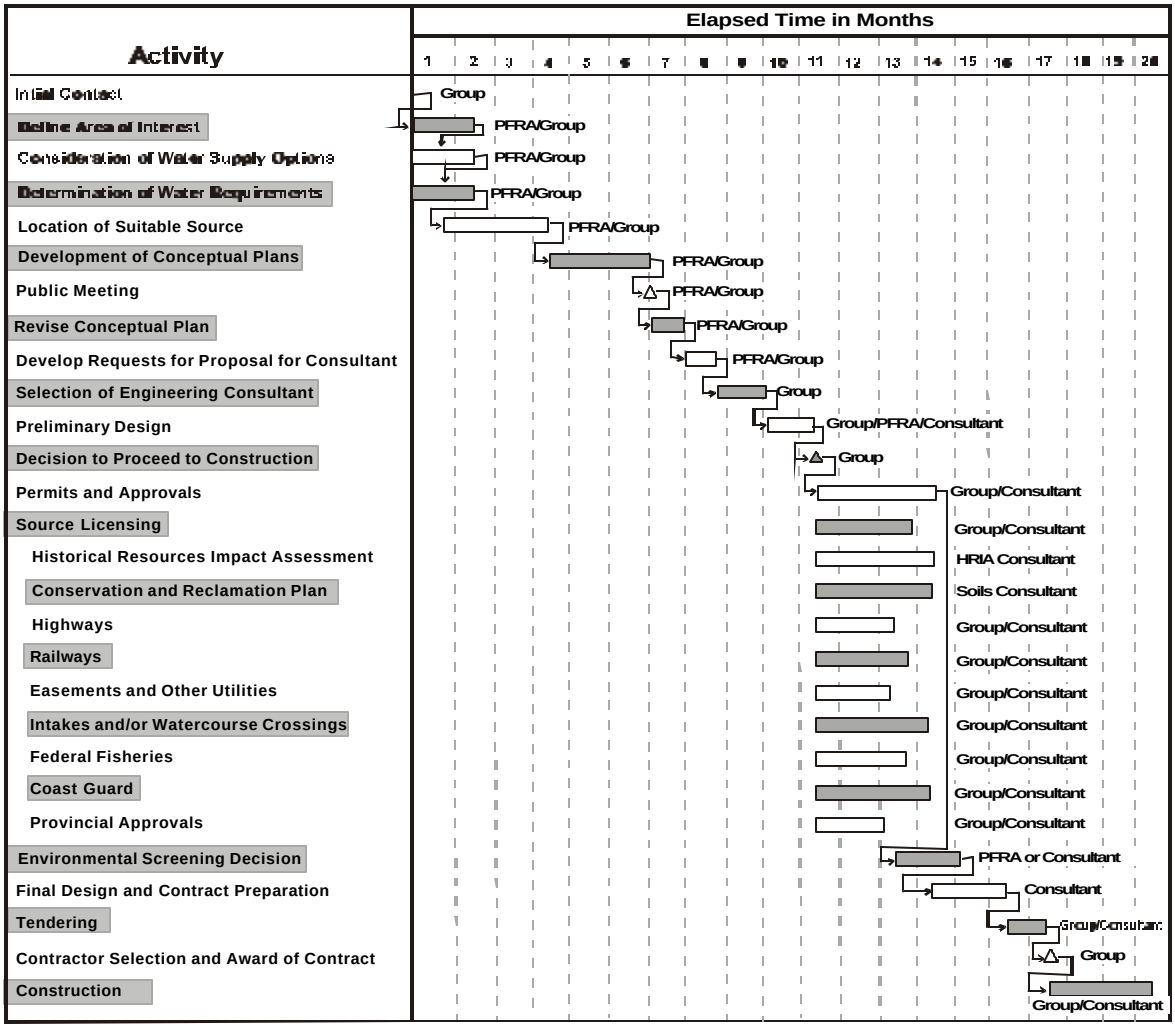
A main meter at the source is essential to determine the water used by the group in order to pay the supplier or to monitor overall water use in the system to determine if there are any leaks in the pipeline. Individual household meters are required by the group to determine the individual water use charges.

3.12.7 Water Treatment

Health Districts recommend that all supplies smaller than 4,000 gallons per day be chlorinated at the source and maintain an adequate chlorine residual to the end of the pipeline (e.g.. free chlorine residual of 0.1 mg/L or total chlorine residual of not less than 0.5 mg/L). However, the approval of the local Health District may approve point of use treatment of the water. PFRA staff may assist with assessing the general suitability of a potential supply, as well as potential treatment options.

Section 4 Timing and Scheduling

A group wishing to undertake a pipeline project will generally be unfamiliar with the process and time required to take the project from the conceptual to implementation stage. It is not uncommon for a group to spend over a year deliberating over conceptual-level studies before arriving at a decision to proceed to the next stage. Once this decision is made, there is often pressure to get the project built as soon as possible, due to time constraints associated with some external sources of funding. However, it is important for the group to understand that a considerable amount of time is required for the following stages, much of which is devoted to obtaining permits and approvals. The chart shown below provides an indication of how the various activities involved in the development of a pipeline project should be scheduled, and it also provides an indication of how long it might take to advance a pipeline project from conception to completion.



Typical Pipeline Project Timeline

The time required for each activity will, of course, vary according to the scale and complexity of the project. Also, as noted previously, the amount of time devoted to conceptual-level studies at the initial stages of development will depend on the nature of the group, the ease with which a water source can be found, and the amount of time required to secure funding.

The time at which decisions are made and activities undertaken will also affect the over-all time required for developing a project. For example, some activities cannot be undertaken at certain times of the year (Heritage resource impact assessments cannot be undertaken when there is snow on the ground; construction of intakes and/or crossings may be prohibited at certain times of the year, etc.). Other activities, such as pipeline installation, while possible to undertake year-round, are more costly during the winter. That being the case, the chart should probably be viewed as the most optimistic time line for development of a pipeline project.

RURAL WATER PIPELINE HANDBOOK FOR SASKATCHEWAN

TECHNICAL DESIGN

June 2000

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Section 1 Design Philosophy

1.0 Design Objective

The objective of rural pipeline design is to economically provide as many rural residents and small communities as is practical with a secure and sufficient supply of quality water.

1.1 Rural Pipeline Design vs Municipal Design

The following is a list of design parameters that are employed in rural pipeline design that are not used in municipal design:

1. Delivery is based on an average flow over a 24 hour period;

2. Fire flows are not considered.

3. The layout is based on branch design. Loop design has not been used.

4. The client must install storage (cistern) to provide capacity to meet peak demands during the day and to insure a supply of water during periods when the pipeline is not operating

5. The client is expected to install their own in house pressure system to provide desired pressure. In some circumstances, in house treatment systems may be installed by the client.

1.2 Flow and Pressure Requirements

1.2.1 Design Flow

Rural pipeline designs are generally based on the assumption that each client would simultaneously receive a design flow of 0.076 l/s (1.0 igpm). This flow represents a balance between cost, client need, and experience based on the operation of previous rural pipelines. It has been shown that the 0.076 l/s will:

1. Result in an economically viable project;

2. Meet the client's current and future in-house and outside (livestock and plants) average daily requirements; and

3. Provide additional capacity for future expansion (an important consideration given the investment of public funds).

Some clients require more than basic 0.076 l/s flow (large livestock operations or small communities). In these cases, the client's actual average daily flow requirement is used. Appendix P contains information on how to calculate the amount of water that a client may require.

In some situations a design flow of 0.038 l/s (0.5 igpm) has been used as the basis of design. The designer should be aware of the potential future demand that may be placed on the system and ensure that the system capacity can handle future demand. Future demands may involve flows required by new clients and/or an increase in the flows required by existing clients.

1.2.2 Actual Flows

The actual flow at any given point and time along the pipeline will be different than the design flow when the system is operational. The nature of the actual water use in the system and the location of a specific user in the system will affect the flow that is available for that user. However, when flows are considered over a 24 hour period they should be sufficient to meet the all of the clients daily water requirements.

Appendix P contains typical usage data for a member of rural pipeline groups. The results, to date, indicate average usage rates of 800 to 1600 l/day (175 to 350 igpd). The **average** flow rates were 0.015 to 0.023 l/s/client (0.2 to 0.3 igpm) and the **peak** flow rate was 0.053 to 0.121 l/s/client (0.7 to 1.6 igpm).

1.2.3 Design Delivery Pressure

The system is designed assuming that under the design flow condition (typically 0.076 l/s), the minimum water pressure at each curbstop is 98 kPa (10 m of head, 14 psi). This minimum pressure should be checked to ensure that it is sufficient to compensate for any head losses between the curbstop and the clients storage tank.

1.2.4 Actual Delivery Pressure

The actual curbstop pressure will be significantly different than the pressure under the design flow conditions. The pressure available at any specific point will depend on the actual water use in the system and in most cases, the pressure will be higher than the design flow pressure. During certain operating conditions, however, the pressure at some curbstops may actually be below 98 kPa (10 m of head, 14 psi).

1.3 Storage Requirement

Rural water pipelines are not designed to provide uninterrupted on demand pressure and flow to clients. Temporary shutdowns of the rural pipeline and its source may occur leaving the clients without water for short periods. It is a requirement of the RWDP and PFRA that all water service connection points provide adequate water storage. The

size of the storage should be based on the client's need for an uninterrupted supply of water. One or two days supply should be sufficient which may range between 450 and 4500 litres (100 to 1000 ig).

Section 2 Source Development

2.0 General

Suitable sources of water for pipelines may be wells, river intakes, lake intakes, existing pipelines and municipal systems. The source may deliver raw water or treated water. The quality of each source of water should be investigated to determine treatment requirements.

Sources generally require that a meter, an isolation valve and backflow prevention device be installed to protect the source.

2.1 Existing Pipeline

2.1.1 General

An existing pipeline must have sufficient capacity to supply a new rural pipeline project without adversely affecting supplies to the existing clients. Design flow should be used to determine the impact on the existing pipeline's pressure and flows, particularly at the connection point.

If the existing pipeline cannot deliver adequate pressure (assuming there is enough flow) to supply the new pipeline, a booster station may be required.

2.1.2 SaskWater Corporation (SWC) Utility Pipeline

Connecting to a SWC Utility pipeline requires a manhole, water meter, backflow protection device and isolation valve. The SWC Office in Watrous will advise of flow and pressures at the connection point as well as any limitations. If a booster station is required, the above mechanical equipment would be housed inside the pumphouse.

2.1.3 Other Group Pipeline

When connecting to an existing pipeline, the new pipeline may not require a manhole, water meter, backflow protection device and isolation valve. As the pressures and flow at potential tapoff points are unknown, testing (pressure and flow at current and peak usage rates of the existing pipeline) will be required. If the existing pipeline does not have sufficient pressure, a booster station will be required.

2.2 Wells

New and existing wells can also provide a rural pipeline with a source of water. The well should be pump tested and the sustainable yield determined. If the well is of

acceptable quality and capacity it can be developed as a source for the rural pipeline. (See section 4 of the Group Organization and Administration Manual).

2.3 River or Lake Intake

River and lake intakes can be difficult structures to engineer and construct. The seasonal variations in water levels can be considerable and the intake location may be subject to sedimentation. Intake structures must supply a year round supply for the life of the project. It is advisable to investigate possible existing intake structures rather than developing a new one.

A submersible pump can generally be installed in an existing intake works with out interfering with the operation of the wet well. The effect the increased flow has on the wet well water level should be considered. Also, the electrical energy required by the submersible pump should be determined to see if the existing power supply is adequate to handle the increased load.

2.4 Municipal Systems

Municipal systems usually provide reliable sources of good quality water. The capacity and pressure available at a particular location may be obtained from the town or by testing. A booster station will be required if the municipal system's pressure is not sufficient to operate the rural pipeline.

Section 3 Pipeline Design

3.0 Pipeline Materials

Pipelines can be designed for both polyvinyl chloride (PVC) and polyethylene (PE) pipe. PE pipe in the sizes generally used for rural water pipelines has an advantage in that it can be shipped in reels and can be plowed directly into the ground. PVC pipe supply can be more economical, but installation is relatively more costly. The advantage and disadvantages of both types of pipe should be presented to the group so that the best option can be chosen.

PVC pipe shall be CSA certified and conform to the requirements of CSA:B137.3-M1990. PE pipe shall be CSA certified and conform to the requirements of CSA:B137.0-1986. The pipe material shall be certified suitable for potable water by the CSA testing Laboratory.

3.1 Minimum Line Sizing and Series Selection (Pressure Ratings)

1. The diameter of all lines shall be such that the maximum water velocity is less than 1.0 m/s.

2. For PVC pipe, 75 mm diameter and smaller, a minimum Series rating of 1103 (160 psi) shall be used. This is based on pipe handling rather than pressure rating criteria. For PVC pipe larger than 75 mm diameter and for all sizes of high density PE pipe, the Series rating of the pipe shall be selected based on the design procedures recommended by the pipe manufacturers.

3. The minimum series rating used for PE pipe will be 689 kPa (100 psi).

4. In general, the minimum size of line serving three or more connections, should be 50 mm.

5. The minimum size of pipe on the source side of the curbstop is 38 mm diameter.

3.2 Design

3.2.1 General

On rural pipelines, flow velocities are generally designed to be less than 1 m/s to minimizes surge problems.

The pipeline should be designed to handle the operating pressure plus surge (if applicable) as well as the pump shut off condition (if applicable). The designer should be aware that negative pressures can occur and consider the conditions that may lead to their occurrence.

Pressure losses in PVC and PE pipe shall be calculated using standard friction loss formulas, as recommended by the pipe manufacturers. The modified ISO formula shall be used to select the pipe pressure ratings as per the pipe manufacturers specifications.

1. The Series rating (and pipe diameter) should not change in the middle of a section of pipeline, unless elevation change is great (at coulees/river crossing); changes should be made at defined points such as valves, tees, pumphouses etc.; and,

2. The number of pipe changes in a pipeline should be minimized to avoid confusion.

3.2.2 Allowances for Future Capacity

Future capacity requirements should be identified by the groups as soon as possible, to ensure proper design of pipe. However, existing systems without "designed" future expansion can usually accommodate additional clients if storage is added or by adding on a booster station(s). Adding more connections to an existing system may decrease the pressure and flow for some patrons. Patrons on existing projects currently not using flow restrictors may require flow restrictors to accommodate more tapoffs.

Where the potential for future expansion exists, the pipeline should be designed to accommodate the anticipated expansion (e.g. an extra 5 igpm (0.38 L/s) for future connections at a specific location along and/or at the end of a current pipeline).

The group should consider the possibility of reasonable future expansion from two perspectives:

1) expansion of their own system and,
2) expansion for other user groups to tap into the existing supply.

Expansion can be built into the system through a combination of:

1) over sizing pipe and supply manifolds;
2) incorporating tees for future source or booster pumps; and
3) designing higher capacity pump and pressure tank systems.

The group is encouraged to make every effort to provide for expansion of their system to accommodate future users. PFRA may require an allocation of water for future expansion.

3.3 Pipeline Installation

Pipelines will be installed to a minimum depth of 2.4 metres (8 feet) (to top of pipe) to avoid damage from frost.

No pipe shall be laid in water, on frozen foundations, or when the trench conditions are unsuitable. Generally, sand bedding of the pipe is not required, except where the foundation is rocky or when backfill material consists of hard blocks of soil or is otherwise unsuitable.

In general, four types of pipeline installation methods are common and are outlined below:

1) Trenchless plough method - involves construction equipment with a plough shoe and pipe placing sleeve. This method minimizes ground disturbance. Contractors have successfully installed up to and including 150 mm diameter PE pipe.

2) Chain trencher method - involves construction equipment with a moving chain complete with teeth. This method causes some ground disturbance, with excavated soils placed on each side of the trench. Care must be used when backfilling the pipe so that falling soil or rocks do not damage the pipe.

3) Backhoe method - this method results in major ground disturbance, depending on the soils being excavated. Extreme care must be used when backfilling the pipe so that falling soil or rocks do not damage the pipe.

4) Directional bore method - commonly used where access is limited and where no ground disturbance is tolerated (eg. At river/stream crossings, at large deep sloughs and sensitive areas (eg. some farm yards with lots of utility crossings)).

Technical pipeline specifications and plans cover the pipeline installation in detail, and are included as Appendices R and S.

3.4 Pipeline Mechanical Appurtenances

3.4.1 Manhole Connection

Depending on the source of the water supply, a manhole may be required. If the source is a Sask Water pipeline or other major pipeline (eg. City of Regina Pipeline)

a manhole is required. The manhole must include a water meter, isolation valves, and backflow prevention device (in some cases a pressure reducing valve) . In some cases, the manhole and connection may be installed by the source utility (eg. City of Moose Jaw) but is generally the responsibility of the group. Manholes can be constructed of various approved materials which can include precast concrete, corrugated steel pipe, or fibreglass.

3.4.2 Isolation Valves (Shut-Off Valves)

Gate valves generally should be located at least every three to five kilometres. On larger projects where one mainline feeds several smaller mainlines, a valve should be placed at the beginning of the smaller mainline so it can be isolated from the larger mainline for repairs, testing and future connections without disrupting service on the other mainlines.

3.4.3 Manual Air Release Valves

Manual air release valves are not normally placed at every high point in the line. The number of manual air release valves should be kept to a minimum. Where possible, manual air release valves should be placed at the ends of mainlines so they can be used for both air purging and flushing of the mainline, provided water meters are not connected. House connections, where possible, will be used to purge air from the pipeline for filling. Manual air release valves (and house connections) are also used to access the pipeline for testing.

In some cases no air release valves are installed initially. If any are required during the pipeline filling, flushing and testing process, they are installed at that time.

3.4.4 Automatic Air Release Valves and/or Combination Air Release Air Vacuum Valves

Automatic air release valves and combination air release/air vacuum valves are not common and are only installed where a line break or other situations could create a large negative pressure in the system. These valves are required to be placed inside a manhole/pump house for frost protection.

3.4.5 Backflow Prevention Devices

Double check backflow prevention valve assembles are required at the source connection and at all subscriber connections.

3.4.6 Curbstops

Required in all cases to isolate each client connection from the main line. The location of the curbstop is determined by the group in consultation with the client, unless instructed otherwise by a regulatory agency such as Sask Water, Sask Health, Sask Environment, or the water purveyor.

Normally the curbstop is located from 1 to 20 metres from the delivery point (household) but can be placed at an individual's property line. Placing the valve at the delivery point makes it easier to locate and access in an emergency or when isolating the

house from the system to repair or replace components in the house. Placing the curbstop too near the house, however, can result in flooded basements should leaks occur at the curbstop.

3.4.7 Other Appurtenances

Tees, caps, or plugs should be installed in all locations of possible future expansion. A minimum length of 2 metres of pipe should be installed at the tee to facilitate locating and installing pipe in the future.

Stainless steel service saddles can be used for 75 mm or greater size pipe. Full flow tees to be used for 50 mm or smaller.

Although 'pigging' stations are not normally installed along the pipeline route, pigging tees or wyes should be installed in all pump stations and manholes. Pigging may be required during the initial purging of air from the pipeline.

3.5 Household Mechanical

Typical household mechanical system layouts are shown in Appendix S-3.

3.5.1 Isolation Valves

Ball valves should be used as isolation valves inside the household. They can be used to isolate the house from the curbstop and also to isolate the household mechanical assembly.

3.5.2 Water Meter

A water meter with remote readout will be installed in every house/yard connection to monitor water consumption for billing purposes.

3.5.3 Pressure Reducing Valves

Pressure reducing valves may be required at household locations where excessive pressures occur. All pressure reducing valves should be equipped with a strainer and a pressure gauge.

Leakage from household mechanical systems may result if pressures are high and pressure reducing valves are not installed.

3.5.4 Flow Restrictor

Although flow restrictors are not used on all rural pipelines, there are situations in which it is advantageous to incorporate them in the design. Pipelines with significant elevation differences along the route can result in highly variable flows at the points of delivery if flow regulators are not installed. This can affect the operation of the system and complicate the design of booster stations.

Flow restrictors should be located at accessible locations for maintenance as they can be plugged, reducing flow.

3.5.5 Strainers and Filters

Recommended in all cases to protect water meters and backflow prevention devices from damage or malfunction caused by debris in the pipeline. Some pressure reducing valves and flow meters have strainers built into them.

3.5.6 Backflow Prevention Device

A backflow prevention device assembly is mandatory at every subscriber connection.

3.5.7 Pressure Gauge

A pressure gauge is recommended for every subscriber connection.

3.5.8 Storage

A minimum 450 litre (100 gal) storage cistern is recommended for every subscriber connection. (See section 1.4).

3.6 Pumphouse

A manhole style pumphouse is not recommended, as they tend to fill with water, access is restricted and they present some safety concerns (eg. built up of gases).

In general, an above ground building, located above the prevailing ground levels (for drainage) is ideal for a pumphouse. It should be accessible, visible from a grid road and close to a power source. It is recommended that it be inspected daily to monitor equipment and temperatures inside the building.

The client should be informed of all options with regard to choices of equipment, telephone monitoring etc. so that the client can make a informed choice. In general, the client wants a simple fully functional pumphouse, requiring minimum maintenance and at a low cost, with provisions for the addition of equipment, as required.

Appendix S-2 presents typical pumphouse plans which have been used very successfully for the last number of years. The plans include typical mechanical equipment used for a range of sizes and flows.

3.7 Treatment

Water treatment at point of delivery, if required is the responsibility of the client or the group.

3.8 Operation and Maintenance Manual

An operation and maintenance manual should be developed for each rural pipeline including all pump stations. This manual should include: system operation and maintenance instructions for all components, a summary of house mechanical system, backflow prevention device information, pipeline and pumphouse design information, pipeline hydraulic grade lines, manufacturer's data, and as built drawings.

Section 4 Pipeline Route

4.0 General

In consultation with PFRA and/or the consultant, the group decides the most practical pipeline route. Most often cost will be the governing criteria for the route selection; however, land control may also be a factor. The pipelines may be installed in road allowances or in easements across private land.

Pipeline shall be placed to minimize and/or avoid disturbance to any environmentally sensitive areas.

4.1 Road Allowances

If the pipeline is installed in road allowances, the group must obtain approval from the appropriate RM and Sask Highways and Transportation office. The group should also obtain assurances from the RM and Sask Highways and Transportation office that the ditch grade will not be adjusted in the future (to protect depth of bury over top of pipeline).

4.2 Private Property

When pipelines are installed in easements (on private property) the group is responsible for obtaining such easements. The group or contractor is responsible for crop damage for the initial installation. The pipeline route should be such that written easements are adequate for land control/registration purposed. Legal surveys are not desirable because of higher cost but, are necessary in some cases. Section 3 in the Group Organization and Administration Manual describes in more detail the easement process.

Easement widths should be kept to 10 to 15 metres if at all possible, to minimize disturbance.

As part of the preliminary survey, PFRA will meet with all necessary individuals to discuss general pipeline route, as well, as routes within their farmyards. Individuals should have a general idea of where they want the pipeline installed and where existing buried underground utilities are located in their yard.

4.3 Crossings

Crossing permits are required for all underground crossings. In some cases (e.g. railway companies) there is a cost for the crossing permit (yearly renewal fees may be charged) to cover administration and inspection costs. Before proceeding to final design, consultation with the companies to limit these costs is recommended.

Each agency will have its own set of standards and guidelines (regarding notice, method of crossing, etc.) that must be followed. These standards must be known prior to tendering so the plans and specifications can be adjusted accordingly. It is necessary to have all approvals in place prior to construction. Section 3 in the Group Organization and Administration Manual deals in more details with crossings**.**

4.5 Geotechnical Information

If test hole data is available for the pipeline route prior to the call for tenders, it should be included in the pipeline tender package. During the tender period, contractors should familiarize themselves with soil conditions along the pipeline route. Two methods are available to obtain this information.

The preferred method of providing information on soils conditions is to dig test pits at any number of locations during the pre-tender site meeting, at locations decided by the prospective contractors, particularly in the case of the trenchless plough method where traditional geotechnical information does not provide the contractors with the level of confidence in ground conditions they desire. The pipeline group may arrange to have a backhoe on hand to accommodate this test dig.

The second method of obtaining soils information is by using a drill rig. Usually test holes are drilled every 800 to 3000 metres along the pipeline route. Where it is speculated that soil conditions may significantly affect unit prices including areas close to augered crossings (e.g. highways, railways, and rivers) extra holes may be required.

RURAL PIPELINE HANDBOOK FOR SASKATCHEWAN

PFRA / GROUP / CONSULTANT ROLES

June 2000

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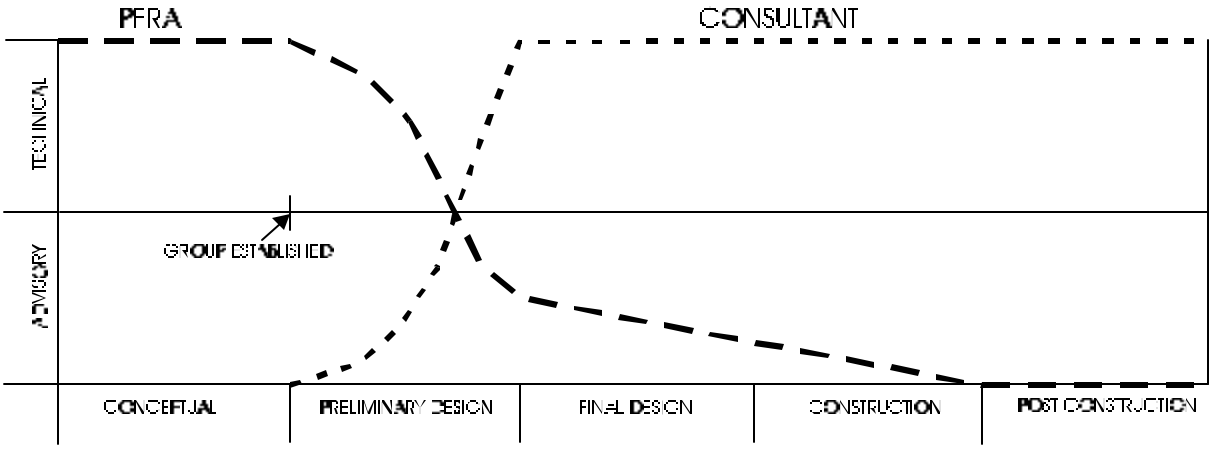
Section 1 PFRA / Consultant Role in Rural Pipeline Projects

1.0 Introduction

PFRA has played a major role in the planning, design and construction supervision of a number of rural water pipelines ranging in size from a few kilometres to nearly 300 kilometres in length. Under the auspices of the Rural Water Development Program (RWDP), PFRA has provided technical and financial assistance from the initial project development through to the operation of the works. In a number of recent projects, components such as the design and inspection of the electrical, control systems and water quality investigations have been contracted out to consulting firms. It is PFRA's intent to continue to provide planning and project development services to rural pipeline Groups, however, the Groups are now required to use the services of private sector consultants for the final design and engineering services during construction for all aspects of rural pipeline projects. This section will attempt to define the roles of PFRA, the Group and the consultant in each phase of project development.

1.1 Project Phases

Typically, there are five phases in the development of a rural pipeline project: 1) conceptual, 2) preliminary design, 3) final design, 4) construction and 5) post construction. In the initial stages, the proponents are generally a few local residents who approach PFRA with an interest in developing a rural water distribution system to provide a reliable supply of good quality water for in-house use and livestock. The area to be serviced and number of individual hook-ups may be uncertain at this stage. PFRA will continue to play a lead role until such time as a Group is established and has the financial resources to carry the project to completion with the assistance of a consulting firm. The following sketch shows the anticipated roles of PFRA and consultants as a project proceeds from the conceptual stage through to completion. The involvement of the Group will remain constant throughout the process.



Each phase is discussed below as well as the role that PFRA , the Group and Consultants play as the project progresses from the initial stage through to completion.

1.2 Conceptual Stage

When a group of area residents wish to investigate the feasibility of a pipeline they should contact the district PFRA office. Appendix A contains a map showing the area covered by each of the PFRA District Offices, including the phone number of each office.

Upon receiving a request to determine the feasibility of a rural pipeline project, PFRA will undertake an office study. Input will be required from the proponent to define the area to be serviced and to identify potential users within the area. A mail out questionnaire to all residents in the area is sometimes used to determine the level of interest and to collect information. PFRA can assist with the development of the questionnaire.

Conceptual designs and cost estimates may be prepared for various alternatives and levels of participation. Cost estimates for the various alternatives are based on previously constructed projects and other available information. Possible funding under the RWDP or other programs can be discussed at this time.

The results of the initial investigations are presented to residents in the project area at a public meeting. Personnel from PFRA will be available to discuss the design criteria used in the development of a rural pipeline project, the results of the conceptual study, in-house connection details, permit and approval requirements, possible funding, and the steps necessary to continue the process. At this time the Group should appoint a steering committee to work with PFRA. The results of the meeting may warrant a re-evaluation of the project area and/or of conceptual design, the results of which may be presented at follow-up meetings.

Once the project has been defined and the proponents wish to proceed, they should organize into a legal entity (such as a cooperative, water user's association or public utility) with an elected executive. The types of organizational options are discussed in the Group Organization and Administration Section of this manual. The Group should ensure that all residents in the project area are made aware of the project and collect a subscriber fee from those who want a hook-up. This fee will allow the Group to pay for miscellaneous expenses and to set up a contract with an consulting firm to work with PFRA in the development of a preliminary design. If the project proceeds beyond the preliminary design stage the consulting firm may assume responsibility for the final design and engineering services during construction.

Next, the Group must select a consulting firm. PFRA can assist the Group in the preparation of Terms of Reference which will serve as a request for proposals to be invited from consulting firms, and will provide a list of consulting firms who have the capacity to undertake the design and engineering services during construction of a rural pipeline. (Appendix Q provides a typical example of a Terms of Reference.)

PFRA will prepare a project brief which describes the project, provides cost estimates and a plan of the project showing the pipeline layout and location of booster stations.

In general, the Terms of Reference will describe the work for the following components: participation in completion of the preliminary design; completion of final designs, preparation of tender documents, tendering and awarding of contract; engineering services during construction; and post construction services. PFRA will also assist the Group in evaluating proposals; however, the selection of a consulting firm will be the Group's responsibility. (Appendix Q provides typical criteria used to evaluate proposals.) Upon selection of a consulting firm, an Agreement between the firm and the Group would be signed that details the engineering services to be rendered by the firm. (Appendix Q provides a Standard Form of Agreement Between a Client and Engineering Consulting Firm.) The first and last components will generally be on a lump sum payment basis and the remaining components will be on a daily or hourly rate basis with an upset limit.

1.3 Preliminary Design

PFRA will continue to provide technical services to complete the preliminary design phase. The Consultant will be expected to attend all Group executive and general meetings to become familiar with the Group and project.

The Group and PFRA will determine the preliminary pipeline route and location of the pipe. The route is determined by the location of the source, points of use and problem areas such as highways and railways. The location of the pipe refers to whether it is installed primarily in road right-of-ways or on private land. Both the route and location of the pipeline will affect the project cost and the type of land control required.

Land control (obtaining easements, crossing permits etc.) is the responsibility of the Group. PFRA can provide some assistance, however it is recommended that the Group solicit legal advice in this regard. As well there are several examples of the forms required in Appendices.

The Group is responsible for obtaining all required approvals and permits; however, PFRA and the consultant will provide assistance as to where they are required

and how to obtain them. More information is provided in the Group Organization and Administration section of this manual.

A survey of the pipeline route will be undertaken by PFRA. The Group will be responsible for contacting each subscriber, preparing a yard plan showing buildings and buried utilities and locating the curbstop within the yard. A base map showing the preliminary pipeline layout overlain on legal fabric will be prepared by PFRA. A preliminary design based on the survey will be prepared by PFRA and discussed with the Consultant to determine pipeline sizes and pressure ratings and revise the preliminary cost estimate.

The federal environmental assessment process is initiated once the preliminary design has been prepared and prior to a formal funding agreement between PFRA and the group. Refer to Appendix M and the PFRA Environmental Assessment User's Guide (updated May 1999).

A general meeting with the Group should be held to review the pipeline route, advise the Group of any changes in project costs and to revise the subscriber list, if necessary. As a rule, minor changes do not generally require any revisions in the preliminary design, however, if there are a number of additions or deletions to the subscriber list it may be necessary to revise the preliminary design and cost estimate.

Once the preliminary design and cost estimate have been accepted by the Group and PFRA, a formal funding agreement between the two parties is entered into. PFRA will prepare the agreement for both parties to sign.

PFRA will finalize the preliminary design, review it with the Consultant, and update the Project Brief outlining the scope of the project, typical details and design criteria, and estimated costs for submission to the Group for approval to proceed to final design. At the request of the Group, PFRA will forward CAD file drawings of the base map showing the pipeline layout, standard detail drawings , typical specifications, and typical crossing drawings to the consulting firm. Survey data of the pipeline will also be provided in a mutually agreed upon format.

1.4 Final Design

The consulting firm will prepare tender documents for construction contracts on behalf of the Group. These will include specifications and drawings which completely describe the works. Some Groups have opted to provide in-kind services for the construction of wood frame pumphouse buildings. In such cases, the Consultant would work with the Group to design the mechanical and electrical components of pumphouse(s). Highway, railway, pipeline and stream crossing details will be prepared as part of the

tender documents and for submission by the Group to the appropriate agencies to obtain the required approvals and permits.

The draft tender documents will be forwarded to the Group and PFRA for review and comment. Upon approval by the Group, the Consultant will finalize the tender documents.

The individual subscribers will assume responsibility for that portion of the service line from the curbstop to the final point of delivery. PFRA can provide typical drawings and material specifications for various types of in-house connection/storage options.

The Consultant will be responsible for tendering the project on behalf of the Group. The Consultant will forward the tender packages to contractors and respond to inquires from bidders. (PFRA can provide a list of contractors who have worked on previous projects.) A pre-tender site meeting should be held and qualified contractors requested to attend. The Group should arrange for a backhoe to be on site and test pits excavated at those locations identified by the contractors.

The Consultant will be present at the public tender opening and will assist the Group in reviewing and evaluating the bids. The Consultant will make recommendations on the award of the contract(s). The Group shall provide a copy of the bid summary to PFRA and the Consultant's recommendation for PFRA approval to award the contract.

1.5 Engineering Services During Construction

The Consultant will provide general and resident engineering services during construction of the project to ensure that the project is constructed as per the plans and specifications. Prior to the start of construction the Consultant will meet with the Contractor and Group to review the terms of the contract with the Contractor, review the contractors schedule, and to establish progress payment procedures.

The Consultant will lay out the pipeline route and locate related works as per the schedule and prepare progress reports, noting field changes, conditions, and unusual occurrences. The Consultant and Contractor will meet regularly with the Group to review and update the schedule.

The Consultant will review all progress payment claims to ensure that all expenditures charged against the project are legitimate and within the contract authority and recommend payments to the Group. The Consultant will regularly prepare and submit a progress report and payment summary to the Group, and advise on any changes in the contractors schedule.

The Consultant will ensure that proper records are maintained by the Contractor.

The Group may engage an individual(s) to provide essentially full-time inspection of the routine aspects of construction, in particular, pipeline installation to specified depth. The Consultant will be present at critical events such as major crossings, line filling, flushing, disinfection, pressure testing and commissioning of booster stations.

The Group will arrange for inspection of all in-house connections to ensure that they are made in an acceptable manner and conform to the backflow prevention requirements of the District Health Officer prior to the opening of the curbstops.

1.6 Post Construction

Upon completion of the project the Consultant will prepare “As Constructed” drawings suitable for “Permission to Operate” under the Sask Water Act and provide two copies to the Group. Operation and maintenance manuals for the pipeline and booster station(s) will be prepared by the Consultant. The Consultant will ensure that the operator is trained in the operation of the system and has the appropriate reference material to monitor and adjust the system operation, maintain valves and other appurtenances, and to undertake minor repairs.

Post project evaluation will be undertaken by the Group, Consultant and PFRA.

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APPENDICES

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APPENDICES

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